

Global Precipitation Measurement Mission

NASA Resources related to the “Extreme Events” Docent-led script

All life relies on the availability of water. Knowing when, where, and how much it rains or snows is vital to understanding how weather and climate impact our environment, and in turn human society. The movement of water and energy around Earth affects agriculture, fresh water availability, and the occurrence of natural disasters.

In many parts of the world, rain is the only source of water for both drinking water and agriculture. Rain also recharges groundwater in aquifers, and spring snowmelt replenishes rivers, streams and wetlands. Having too much or too little water often results in natural disasters for populations around the world, where tropical cyclones, floods, droughts, and landslides can wreak havoc on local communities. Having accurate information on rain and snow is critical for estimating when to plant crops, where to build houses, how to plan transportation routes, and informing disaster assistance during and after extreme weather.

This resource guide has been developed to assist docents in providing supplemental lesson plans, videos, data sets, hands-on activities, and other types of resources to educators or other participants who might benefit from having supplemental materials.

LESSON PLANS AND ACTIVITIES

Measuring Precipitation: This inquiry-based lesson engages students in designing and testing a device to measure rain. <http://pmm.nasa.gov/education/lesson-plans/measuring-precipitation>

SOS Water Falls Post-Visit lesson: This lesson plan is designed to be used with participants after they have watched the film, “Water Falls”. The focus is on understanding how our latest technology is improving our abilities to respond to natural disasters, such as hurricanes. **This lesson will be available on the Water Falls website in early October** (<http://pmm.nasa.gov/waterfalls/education>)

Landslides and Erosion: Students will investigate the effect of different types of soil on how quickly a landslide occurs and how much mass is moved. They will then relate that information to precipitation data from the Tropical Rainfall Measurement Mission (TRMM)/Global Precipitation Measurement (GPM) to identify areas currently susceptible to landslides. <http://pmm.nasa.gov/education/lesson-plans/landslides-erosion>

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Monsoons: In this lesson, students will consider how we measure determine weather on the ground and from satellites. Students will look at data from the TRMM (Tropical Rainfall Measuring Mission) satellite and compare monthly rainfall patterns in the Eastern U.S. to those in India to observe the seasonal monsoon weather pattern.

<http://pmm.nasa.gov/education/lesson-plans/monsoons>

Weather & Climate iQuest: This IQuest has been developed to help you explore the wild and changing world of weather and climate. Weather and climate are shaped by complex interactions involving sunlight, the ocean, the atmosphere, clouds, ice, land, and life forms.

<http://pmm.nasa.gov/education/interactive/weather-climate-iquest>

Floods iQuest: This is an introductory lesson to acquaint middle school students to many aspects of a serious and common natural disaster; flooding. Students will be directed to visit websites where they will interact with various types of media.

<http://pmm.nasa.gov/education/interactive/floods-iquest>

Hurricane Frequency and Intensity: If the Earth continues to warm, what does that mean for hurricanes and their intensity? Your job is to look at past hurricane data by researching the intensity and frequency of hurricanes using the Live Access Server and several Internet sites. <http://pmm.nasa.gov/education/lesson-plans/hurricane-frequency-and-intensity>

El Nino Lesson: In this lesson, students are guided to explore an historical El Nino event using real satellite data and to correlate El Nino to local weather.

<http://pmm.nasa.gov/education/lesson-plans/el-nino-lesson>

Hurricane Katrina: A Problem-Based Learning Module: In this activity, students are tasked with conducting an Earth systems analysis of Hurricane Katrina that will help answer the question "Is global warming causing an increase in hurricane frequency and intensity?" <http://pmm.nasa.gov/education/lesson-plans/hurricane-katrina-problem-based-learning-module>

EarthLabs: Drought: When drought occurs, water supplies for agriculture, industry, and personal use decrease, and people need to find ways to cope with the shortage or leave the area. This series of lesson plans teaches students about the science of droughts.

<http://pmm.nasa.gov/education/lesson-plans/earthlabs-drought>

Exploring the Environment: Drought Problem: This problem-based learning module takes students through a real-world scenario- drought in Texas- and has them use satellite images and other actual data to answer questions about how Texas and other states in the Great Plains should respond to the situation. <http://pmm.nasa.gov/education/lesson-plans/exploring-environment-drought-problem>

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WEBSITES

Precipitation Education: This is GPM's education and public outreach website. There are four main categories: water cycle, weather and climate, technology, and societal applications. Each of these categories have many educational resources that include descriptions about each resource, information on intended audiences, and a lot of other useful information. <http://pmm.nasa.gov/education/>

Citizen Science: Measuring and Sharing Precipitation Data with CoCoRaHS: CoCoRaHS is a Citizen Science organization that helps participants collect and share precipitation data. They also assist teachers in learning how to install and use rain gauges with their students. Learn how to collect and submit measurements to CoCoRaHS.

<http://pmm.nasa.gov/education/websites/citizen-science-measuring-and-sharing-precipitation-data-cocorahs>

EROS Image of the Week: Natural Disasters: View before and after images of natural disasters and human impact in various locations around the world.

<http://pmm.nasa.gov/education/websites/eros-image-week-natural-disasters>

VIDEOS AND DATA ANIMATIONS

GPM: Too Much, Too Little: Researchers need accurate and timely rainfall information to better understand and model where and when severe floods, frequent landslides and devastating droughts may occur, and GPM's global rainfall data will help provide that information. <http://pmm.nasa.gov/education/videos/gpm-too-much-too-little>

Faces of GPM: Dr. Dalia Kirschbaum, GPM Applications Scientist: Dr. Kirschbaum discusses her role with GPM, how she became a scientist, and how remotely sensed satellite data can be used to study and evaluate natural hazards such as landslides.

<http://pmm.nasa.gov/education/videos/faces-gpm-dr-dalia-kirschbaum-gpm-applications-scientist>

Towers in the Tempest: 'Towers in the Tempest' is a 4.5 minute narrated animation that explains recent scientific insights into how hurricanes intensify. This intensification can be caused by a phenomenon called a 'hot tower'.

<http://pmm.nasa.gov/education/videos/towers-tempest>

Real World: Hurricane Hunters: This NASA video segment focuses on how scientists use satellites to collect data. These sets of data are then analyzed and used to predict storms.

<http://pmm.nasa.gov/education/videos/real-world-hurricane-hunters>

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GPM: Hurricanes Beyond the Tropics: Hurricane Irene's impact in New England shows that tropical cyclones can greatly affect regions outside the view of TRMM. The GPM mission will build upon TRMM's legacy by examining a larger swath of Earth.

<http://pmm.nasa.gov/education/videos/gpm-hurricanes-beyond-tropics>

NASA Our World: What is a Hurricane?: This NASA video segment explains the formation of hurricanes. Go behind the scenes with a meteorologist at the Weather Channel in Atlanta, Georgia to learn how scientists predict hurricanes and hurricane formation.

<http://pmm.nasa.gov/education/videos/nasa-our-world-what-hurricane>

Where do Hurricanes get their Energy?: How do hurricanes get their energy? Hurricane scientist Dr. Jeff Halverson explains how hurricanes draw energy from the ocean surface.

<http://pmm.nasa.gov/education/videos/where-do-hurricanes-get-their-energy>

The Environmental, Economic and Social Impact of Drought: This NASA video segment highlights the impact of drought globally. The video explains how fire risk increases during drought. Fire produces soot and ash that travel across continents via the trade winds.

<http://pmm.nasa.gov/education/videos/environmental-economic-and-social-impact-drought>

OTHER RESOURCES

How do Hurricanes Form?: This short and descriptive article explains that hurricanes are the most awesome, violent storms on Earth. These storms are also called typhoons or cyclones, depending on where they occur but they all form the same way.

<http://pmm.nasa.gov/education/articles/how-do-hurricanes-form>

What is a Hurricane, Typhoon, or Tropical Cyclone?: This descriptive article teaches about what a tropical cyclone is, and how "Hurricane", "Typhoon", and "Cyclone" are all different words for the same phenomena. <http://pmm.nasa.gov/education/articles/what-hurricane-typhoon-or-tropical-cyclone>

Flying Through Hurricanes with Robbie Hood: In this short article, NASA Earth Explorer explains what it's like to be face-to-face with one of nature's most powerful storms.

<http://pmm.nasa.gov/education/articles/flying-through-hurricanes-robbie-hood>

Satellite Monitors Rain that Triggers Landslides: This article explains how NASA scientists use TRMM satellite rainfall data to help predict and prepare for landslides.

<http://pmm.nasa.gov/education/articles/satellite-monitors-rain-triggers-landslides>

Using Satellites to Track Water: This article explores how a university researcher uses NASA satellite data to help Bangladeshi authorities monitor their water resources and prepare for water-related disasters. <http://pmm.nasa.gov/education/articles/using-satellites-track-water>